

**CLAIMS**

WHAT IS CLAIMED IS:

1. A surface modified enzyme comprising an enzyme genetically engineered to include a stabilizing group at the N-terminus, which stabilizing group is used to immobilize the enzyme onto a polymerized vesicle or inorganic surface.

2. The surface modified enzyme according to claim 1 wherein the stabilizing group is selected from the group consisting of histidine and polyhistidine.

3. A method for stabilizing enzymes comprising:  
genetically engineering an enzyme to include a stabilizing amino acid substitution;  
copolymerizing an amphiphile containing a salt selected from the group consisting of metal salts of iminodiacetic acid, nitrilotriacetic acid, and mixtures thereof with other polymerizable amphiphiles to form vesicles;  
binding the genetically engineered enzyme to the salts on the outer surface of the vesicles.

4. The method according to claim 3 wherein the metal salts are selected from the group consisting of copper, nickel, cobalt, and zinc salts.

5. The method according to claim 3 wherein the stabilizing amino acid is selected from the group consisting of histidine or polyhistidine.



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PATENT APPLICATION

6. The method according to claim 3 wherein the enzyme is thioesterase.

7. The method according to claim 3 wherein the salt is a metal salt of iminodiacetic acid.

8. The method according to claim 3 wherein the salt is a metal salt of nitrilotriacetic acid.

9. A method for stabilizing enzymes comprising:

genetically engineering an enzyme to include a stabilizing amino acid substitution;

attaching said stabilized enzyme to salt groups selected from the group consisting of metal salts of iminodiacetic acid, metal salts of nitrilotriacetic acid, and mixtures thereof on the surface of a particular inorganic carrier.

10. The method according to claim 9 wherein the metal salts are selected from the group consisting of copper, nickel, cobalt, and zinc salts.

11. The method according to claim 7 wherein the carrier is a metal oxide ceramic particles that can be formed in the Stober process starting with a metal alkoxide precursor.

12. The method according to claim 9 wherein the metal oxide particles are selected



PATENT APPLICATION

2                   13. The method according to claim 9 wherein the salt groups are metal salts of  
3   iminodiacetic acid.

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